



## Prematurity in a hospital of reference to high risk children

### *Prematuridade em um hospital de referência ao parto de alto risco*

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#### ABSTRACT

To investigate the prevalence of premature births in a referral hospital for high-risk births and to verify the association of maternal factors (demographic, socioeconomic, behavioral, and obstetric) with prematurity. Descriptive cross-sectional prospective and quantitative study, with a population sample of 489 mothers, conducted by interview, for six months. The descriptive analyzes used the Fisher Test for association and logistic regression for multivariate analyzes. The prevalence of prematurity was 11.65%, significantly higher in single mothers (40.4%), with less than nine years of study (40.4%), who belong to economic class C (47.4%), drug users (12.17%), sedentary (12.93%), hypertensive (16.67%) and who were hospitalized (17.82%) or had vaginal bleeding during pregnancy (25.58%). Drug use ( $p = 0.001$ ) and vaginal bleeding ( $p = 0.010$ ) were considered maternal predictors of prematurity.

**Keywords:** Pregnancy. Uterine hemorrhage. Premature birth. Substance-related disorders.

#### RESUMO

Este estudo objetivou investigar a prevalência de partos prematuros em hospital de referência para partos de alto risco e verificar a associação de fatores maternos (demográficos, socioeconômicos, comportamentais e obstétricos) com a prematuridade. Estudo descritivo analítico transversal prospectivo e quantitativo, com amostra populacional de 489 puérperas, conduzido por entrevista, durante seis meses. As análises descritivas utilizaram o Teste de Fisher para associação e regressão logística para análises multivariadas. A prevalência de prematuridade foi de 11,65%, significativamente maior em mães solteiras (40,4%), com menos de nove anos de estudo (40,4%), que pertencem à classe econômica C (47,4%), usuárias de drogas (12,17%), sedentárias (12,93%), hipertensas (16,67%) e que foram internadas (17,82%) ou tiveram sangramento vaginal durante a gestação (25,58%). Uso de drogas ( $p = 0,001$ ) e sangramento vaginal ( $p = 0,010$ ) foram considerados preditores maternos para prematuridade.

**Palavras-chave:** Gravidez. Hemorragia uterina. Nascimento prematuro. Transtornos relacionados ao uso de substâncias.

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## INTRODUCTION

Prematurity is the condition of every living neonate, whose mother's gestational age, at the time of delivery, varies between 20 and 37 weeks<sup>1</sup>, that is, from 140 to 257 days after the first day of the last menstrual period<sup>2</sup>. The World Health Organization (WHO) estimates 15 million preterm births per year, with a million associated deaths, of which 24% could have been avoided by qualifying prenatal care. Preterm births have an upward curve and are concentrated in low-income countries, representing 12% of total births and 90% of deaths in neonates with less than 28 weeks of gestation. In high-income countries, premature births account for 9% and only 10% of births under 28 weeks result in death<sup>3</sup>.

Diseases originating in the perinatal period were responsible for 45% of infant deaths in children under five in the world, in 2015, caused mainly by complications of preterm birth<sup>4</sup>. Pneumonia was overcome by prematurity as the main cause of infant death in 2014<sup>5,6</sup>. Neonates who survive may have visual, hearing and learning problems. Premature births and low birth weight infants are among the main causes of hospital admissions in children under five<sup>7</sup>.

Brazil had 279,300 (9.2%) preterm births in 2010, occupying the tenth position in absolute number in the WHO list<sup>3,8</sup> and the first place in Latin America<sup>6</sup>. The survey Nascer no Brasil identified a prevalence of 11.3% of prematurity in 2015<sup>9</sup> and although the Ministry of Health implemented Rede Cegonha<sup>10</sup> aiming to improve access and assistance to pregnant women, births and neonates, preterm births continued to increase in the country<sup>11</sup>.

The rates of prematurity in Rio Grande do Sul, in 2013 and 2014, were 11.61% and 11.51%, respectively. Porto Alegre, in the same period, presented 11.13% and 10.26%, and Santa Cruz do Sul, 10.68% and 10.23%<sup>12</sup>. In addition to the qualification of care for pregnant women and neonates, WHO advises that induction of natural labor or elective

cesarean delivery occurs only after 39 weeks of gestation<sup>3</sup>.

Risk factors for preterm birth include maternal and obstetric factors, such as the mother's physical and health conditions, pregnancy history, previous morbidity, socioeconomic status, physical effort, prenatal care and type of delivery<sup>3,13</sup>. Data concerning prematurity and its predictors, in a regional referral hospital for high-risk delivery, may qualify epidemiological surveillance at the local and institutional level, in addition to generating relevant information to support health policy and the maternal and child network in the Health Region.

Considering premature birth as the dominant risk factor for neonatal mortality, this study was justified by the high rates of prematurity presented in the State and the municipality, by the need for institutional data to support effective policies, which can contribute to the reduction of preterm births and, consequently, of infant deaths, and to yield new knowledge.

The objectives of this study were to investigate the prevalence of preterm births in a referral hospital for high-risk births and to verify the association of maternal factors (demographic, socioeconomic, behavioral and obstetric) with prematurity.

## METHODOLOGY

Descriptive prospective and quantitative analytical cross-sectional study, carried out at Hospital Santa Cruz, Santa Cruz do Sul/RS, from December 2013 to June 2014. The data sources were interviews and analysis of medical records of puerperal women hospitalized at Hospital Santa Cruz in the evaluated period.

Hospital Santa Cruz is the largest hospital in the 28<sup>th</sup> Health Region, a non-profit philanthropic institution, a reference in regional health in several areas, including high-risk births, for the 13 municipalities that make up the Health Region of Vale

do Rio Pardo, assisting about 330 thousand people. Hospital Santa Cruz is the only health institution in the region that has a conventional Intermediate Care Unit (UCINco) with ten beds, Kangaroo Intermediate Care Unit (UCINca) with five beds and a Neonatal Intensive Care Unit (NICU) with seven beds. Santa Cruz do Sul/RS has a population of 130,416 people, estimated in 2019, demographic density of 161.4 inhabitants per km<sup>2</sup>, human development index (HDI) of 0.773 in 2010, and Infant Mortality of 11.11 deaths per thousand live births in 2017<sup>14</sup>.

The study population consisted of all postpartum women hospitalized or accompanying neonates at UCINco, UCINca and NICU at Hospital Santa Cruz within the evaluated period, including assistance provided by the Unified Health System (SUS), health insurance and private ones. Postpartum women with clinical complications in delivery and postpartum, hospitalizations for abortion, fetal death and twin pregnancy were excluded from the research. Twin births were excluded because they resulted in preterm births, regardless of other risk factors<sup>2,8</sup>.

The sample calculation was performed in the Open Epi program, Version 2, considering a monthly average of 150 births at the health institution, a prematurity rate of 20% of the total live births for an expected error of 3 percentage points, with a power of 80% and alpha of 95%, the final sample was 446 mothers. The rate of prematurity was overestimated because it is a referral hospital for high-risk childbirth for the 13 municipalities in the Health Region and the absence of official indicators of prematurity by health institutions in official publications. In the sample calculation, 10% were added for losses and refusals, totaling 510 postpartum women.

The data were collected in two moments, the first in a face-to-face interview with the mothers and the second in the medical records, considering the team's records. The identification of puerperal women, selected each day for the research, was guided by the maternity board, which identified all patients, with name, bed number, reason for hospitalization,

day of delivery, type of delivery and health insurance, in addition to those who were accompanying the neonates at UCINco, UCINca and NICU. To approach the puerperal women, a minimum interval of 24 hours postpartum was respected.

Data collection was performed using a pre-coded questionnaire, with open and closed-ended questions. The pilot questionnaire was applied to four puerperal women to assess applicability and time required for each interview. The tool consisted of blocks of demographic, socioeconomic, behavioral information, maternal preconception conditions and information related to current pregnancy. After collecting data, the quantitative data were tabulated in the Statistical Package for the Social Sciences (SPSS) v. 20.0.

The dependent variable was infant prematurity (live birth with gestational age between 22 weeks and 36 weeks and 6 days). The independent variables were demographic (skin color, marital status and age), socioeconomic (education and economic class) and maternal behavior (practice of physical activity, smoking, alcohol consumption and use of other drugs), in addition to maternal complications during pregnancy (previous pregnancy, history of preterm birth, hospital stay, urinary tract infection, arterial hypertension and antepartum hemorrhage) and related to the neonate (type of delivery).

The prevalence of prematurity for this study, in percentage, was calculated using the number of preterm births of the interviewed mothers, divided by the total number of the sample, multiplied by 100. For analysis of quantitative data, categories such as skin color and education were grouped, to avoid sets with low frequencies. The categories were completed in two groups, white and non-white, and the categories of education variable were grouped into three categories, considering elementary education (complete or incomplete), high school (complete or incomplete) and higher education (complete or incomplete). The economic class variable was classified according to the standard ABEP (Brazilian Association of Population

Studies) of 2012, which assesses the purchasing power, possession of items and education level of the head of the family, categorizing the scores in classes A, B, C, D and E, with Class A having the highest score<sup>15</sup>.

In the descriptive analyzes, the absolute number, frequency, means, standard deviation and medians were listed. In addition, a univariate analysis was performed to show the distribution of the categories of variables and a bivariate analysis to describe the frequencies in the two groups: mothers of premature and full-term infants. For the association of categorical variables, Fisher's exact test was used and the multivariate analysis was based on the conceptual hierarchical model by levels, performed using Poisson regression, controlling for confounding factors. In this study, those who maintained a  $p < 0.20$  in the univariate analysis were included, according to another similar study<sup>16</sup>. Maternal responses such as "I don't know" or "I don't remember" were disregarded.

Each level was composed of a block of maternal characteristics: level 1 (skin color, education, economic class and maternal age); level 2 (marital status and physical activity), level 3 (smoking, alcohol consumption and use of drugs); level 4 (hospitalization during pregnancy, history of prematurity, high blood pressure, urinary tract infection, being primigravida or not and having had bleeding) and level 5 (type of delivery). The outcome was gestation time, divided into prematurity (22 to 36 weeks and 6 days) and full-term (37 weeks to 41 weeks and 6 days).

The participants of this study received some information about the research and those who agreed to participate signed the Informed Consent Form (ICF). Participants under the age of 18 signed the Informed Assent Form (TALE) and their parents or guardians signed the Informed Consent Form. The project was approved by the Ethics and Research

Committee of the University of Santa Cruz do Sul/ UNISC under number 433,586.

## RESULTS

Within the study period, 837 births took place at Hospital Santa Cruz, of which 525 (62.7%) mothers were approached, with 14 refusals and 11 exclusions due to clinical complications. Thus, the sample was completed with 489 (58.4%) postpartum women. The prevalence of prematurity was 11.65% (57). Of preterm births, 30 (52.6%) were borderline premature (35 to 36 weeks), 21 (36.8%) moderate (31 to 34 weeks) and six (10.5%) were extreme (less than 30 weeks)<sup>2</sup>.

Regarding the demographic and socioeconomic profile, in the general sample of the women interviewed, 357 (73.0%) were white, 230 (47.0%) were single and 239 (48.8%) belonged to economic class B. In the group of mothers of premature infants, being single (40.4%), having less than nine years of schooling (40.4%) and belonging to economic class C (47.4%) were the most frequent characteristics. The fact of having less than nine years of schooling was greater among puerperal women with preterm birth ( $p=0.04$ ). In this study, there was no significant association between preterm birth and type of health insurance ( $p=0.886$ ). Among the behavioral characteristics studied, drug use was higher among mothers who had premature births, as shown in Table 1.

**Table 1.** Maternal behavioral characteristics of interviewed mothers in Santa Cruz do Sul, Brazil, 2013-2014

Variable	Premature		Full-term		Total	
	N	%	N	%	N	%
Practice of physical activity						
No	38	12,93	256	87,07	294	60,1
Yes	19	9,74	176	90,26	195	39,0
Smoking						
No	43	11,50	331	88,50	374	76,5
Yes	14	12,17	101	87,83	115	23,5
Alcohol consumption						
No	47	11,72	354	88,28	401	82,0
Yes	10	11,36	78	88,64	88	18,0
Use of other drugs						
No	52	10,83	428	89,17	480	98,2
Yes	5	55,56	4	44,44	9	1,8

p\* = Fisher's exact test

The maternal characteristics and complications presented during pregnancy are shown in Table 2. The most prevalent age group was 19 to 39

years old (88.7%). The mothers' average age was 28.1 years, with a minimum of 13 years and a maximum of 47 years ( $\pm 6.76$ ).

**Table 2.** Maternal characteristics and complications during pregnancy, of postpartum women interviewed in Santa Cruz do Sul, RS, Brazil, 2013-2014

Variable	Premature		Full-term		Total	
	N	%	N	%	N	%
Age Group						
<19	3	7,69	36	92,31	39	7,9
19 to 39	52	11,98	382	88,02	434	88,7
40 or older	2	12,50	14	87,50	16	3,2
Primigravida						
No	33	12,36	234	87,64	267	54,6
Yes	24	10,81	198	89,19	222	45,3
Prematurity History						
No	51	89,5	410	94,9	461	94,3
Yes	6	10,5	22	5,1	28	5,7
Previous hospitalization						
No	39	10,05	349	89,95	388	79,3
Yes	18	17,82	83	82,18	101	20,6
Urinary tract infection during pregnancy						
No	42	12,39	297	87,61	339	69,4
Yes	14	9,4	135	90,60	149	30,5
Arterial hypertension						
No	46	10,77	381	89,23	427	87,6
Yes	10	16,67	50	83,33	60	12,3
Vaginal bleeding						
No	45	10,11	400	89,89	445	91,2
Yes	11	25,58	32	74,42	43	8,8

p\* = Fisher's exact test

Among the maternal complications investigated, having a history of preterm birth ( $p=0.094$ ), hospitalization during pregnancy ( $p=0.037$ ) and having had bleeding ( $p=0.005$ ) were considered significant factors.

As for the type of delivery variable, 335 (68.5%) deliveries were cesarean. Among premature babies,

36 (63.2%) were born by caesarean section. Table 3 shows the prevalence ratios and the analysis of the variables, which were statistically significant, related to the hierarchical levels for regression analysis. After multivariate analyzes, the use of drugs and having had bleeding during pregnancy were considered maternal factors to predict premature birth.

**Table 3.** Results of univariate analysis and multivariate logistic regression, according to the level of hierarchy of variables, Santa Cruz do Sul, RS, Brazil, 2013-2014

Prematurity		Univariate analysis			Multivariate analysis	
Variable	(T) %	RP	(IC <sub>95%</sub> )	p†	RP	(IC <sub>95%</sub> )
Use of drugs						
No	98,2	10,28	2,67-39,52	0, 002	10,21	2,59-40,21
Yes	1,8					
Vaginal bleeding						
No	91,2	3,05	1,44-6,47	0, 005	2,83	1,28-6,22
Yes	8,8					

## DISCUSSION

The prevalence of preterm births found in this study was 11.65%, a result similar to the rate of the Study Nascer no Brasil (2015), to the state rates of 2013 and 2014, but above the municipal rates<sup>9,12</sup>. This fact was expected, since motherhood is a reference to high-risk delivery in the Health Region and the only health institution that has UCINco, UCINca and NICU.

Bleeding during pregnancy and drug use were considered predictors of prematurity. High rates of cesarean delivery were observed in premature and full-term parturients. Prematurity can be elective, when pregnancy is interrupted by maternal or fetal complications, which accounts for 25% of preterm births, or spontaneous, which can be caused by several factors, often unknown, representing 75% of preterm births<sup>17</sup>. Cesarean deliveries without obstetric indications, scheduled before 39 weeks of gestation may be associated with borderline prematurity. This

concern has already been reported in Niterói/RJ, which presented a percentage of cesarean deliveries close to 70%, in an ecological study from 2000 to 2009<sup>18</sup> and Divinópolis/MG with 62% of cesarean deliveries in a cross-sectional study, from 2008 to 2011<sup>19</sup>.

In the sample analyzed, bleeding during pregnancy was identified as a predictor of preterm birth ( $p=0.010$ ). Antepartum hemorrhage may happen due to factors such as: placental abruption, gestational hypertension, oligohydramnios, early pregnancy and premature rupture of membranes<sup>16</sup>. In Scotland and Japan, studies find a direct association between placenta previa and placental abruption with preterm births<sup>20,21</sup>, in Ethiopia bleeding during pregnancy was associated with prematurity<sup>22</sup>, as well as in Brazil<sup>16,23</sup>. Persistent second-trimester bleeding lead to premature rupture of membranes and studies are divergent regarding the expectant conduct or termination of pregnancy<sup>24,25</sup>.

Maternal habits before conception and during pregnancy are analyzed as possible predictors of high-

risk pregnancy and preterm birth, with emphasis on the use of illicit drugs. The data found in this study corroborate the findings of other studies in associating drug use and prematurity<sup>26,27</sup>. The use of drugs during pregnancy is a behavioral factor that has a negative influence on the fetus as well as after the infant is born, it increases the risk of miscarriage, placental abruption, preterm birth and postpartum bleeding<sup>23</sup>. A retrospective study carried out in Australia, with parturients admitted to the hospital with a history of drug use before conception or during pregnancy, demonstrated a significant increase in adverse effects during pregnancy, including preterm births<sup>24</sup>.

In the sample studied, marital status, physical activity, alcohol use, maternal age, primiparity, pregnancy complications, such as urinary tract infection, were not related to preterm birth, diverging from other studies, in which these variables were relevant<sup>3,16</sup>. These data can be explained by good prenatal coverage, in which 79.68% and 78.96% of pregnant women in the Health Region underwent complete prenatal care in 2013 and 2014, respectively. Pregnant women who have not had any prenatal consultation are less than 1% in both evaluated years<sup>12</sup>. Complete prenatal care decreases the likelihood of preterm birth<sup>16,28</sup>.

The maternal history of preterm births was statistically significant ( $p=0.094$ ). This history is an obstetric condition that may indicate a possible maternal biological characteristic of risk for gestational development and prematurity. The result of this study was similar to other national and international surveys<sup>3,13,16</sup>.

The limiting factors of the study were the selection bias, present in most of the cross-sectional studies, and the non-inclusion of twin births, which is important for estimating the maternal factors that predispose to preterm birth, but which alters the calculation of the prevalence of prematurity. There were nine pregnant women who reported drug use, among which, five had a premature birth. This number is considered small for conclusions about the outcome of prematurity at the reference institution.

## CONCLUSION

The main conclusions of this study show that Hospital Santa Cruz has a high rate of prematurity, 11.65% in the evaluated period, and that the main maternal predictors for preterm birth in the institution, are gestational bleeding, regardless of the time of pregnancy, and drug use before or during pregnancy. These factors cannot be controlled by the hospital, however a plan to reduce cesarean deliveries is recommended according to guidelines of the Ministry of Health<sup>29</sup>. The findings are relevant to the regional health policy, as it guides the qualification of prenatal care and a work to prevent drug use before and during pregnancy, in the municipalities that make up the Health Region of Vale do Rio Pardo. It is assumed that preterm births can be reduced with these prevention and health promotion actions.

Identifying drug use and bleeding during pregnancy as predictors of preterm birth in this institution stand out as strengths of this work. As a downside, it is registered that this study was conducted within a specific period of time, in the researched place, and cannot be generalized to other periods and other institutions. There were no conflicts of interest.

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